

TWO LISTS OF GREEK SURGICAL INSTRUMENTS AND THE STATE OF SURGERY IN BYZANTINE TIMES

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The object of this study is to inquire into the state of the surgical art in Byzantine times, with particular emphasis on the Middle Byzantine Period. As will soon be apparent, I have concluded that a very fruitful approach is through references to the actual surgical tools employed; therefore I shall often be obliged to deal in specifics. However, the larger question must always remain in view: How advanced was surgery from the time of Constantine the Great to Constantine XI Dragases?

To be sure, the period opens very auspiciously. True, there is almost nothing of interest on surgery in the surviving work of Alexander of Tralles (525–605); but we are amply compensated for his deficiencies by the contributions of Julian's doctor, Oribasius, of Aetius of Amida, physician to the court of Justinian I, and of the great scholar/physician of the seventh century, Paul of Aegina. Paul in particular is a mine of information, providing in the sixth book of his *Epitome* extraordinarily detailed descriptions of over 120 operations and the instruments employed in them.¹ While Paul's surgery is venturesome enough to attempt mastectomy and operations for hernia, tumors and bladder stone, still, like all surgeons prior to modern times, the better part of his efforts were confined to the sur-

face of the body or to those areas where natural openings like the nasal and genital passages allowed surgical instruments to be utilized internally. Even so, Paul, Aetius, and Oribasius represent the culmination of all surgery up to their time, demonstrating clearly how much had been achieved since the days of the great Hippocrates.

If, however, we look beyond Aetius and Paul to the accomplishments of surgeons from the time of the Isaurian dynasty to the Palaeologi and the fatal year 1453, this auspicious beginning does not at once seem to be followed by activity of comparable interest. I have found nothing to match Paul's sixth book in subsequent Byzantine medical literature. And if one looks away from the literature and concentrates on the material evidence, that is, the actual surviving surgical instruments of the Byzantine period, the results here too are hardly spectacular. I have assembled as much information as I could on surviving tools, based on my own knowledge and that which came to me through approximately fifty-five letters of inquiry to individuals and museums in fifteen countries. It is appropriate to provide here a catalogue of every object known to me which *could* have been employed for surgical purposes in Byzantine times.

[The reader is referred to the list of abbreviations at the end of the volume.]

I wish to express my gratitude to Professors Henri Amin Awad, Gerhard Baader, Imre Boba, Alexander Kazhdan, Ernst Künzl, Pierre MacKay, John Scarborough, and especially Timothy Miller for their help in the preparation of this paper. I also wish to acknowledge the assistance provided by the American School of Classical Studies in Athens. For the views expressed herein I alone bear responsibility.

¹For Paul I have used the Greek text edited by Heiberg.

I

A. A series of fifteen objects from Byzantine Corinth are of interest. These were published by G. R. Davidson in *Corinth*, Volume XII, *The Minor Objects* (Princeton, 1952), nos. 1377–1391. All the pieces are of bronze; most of them were discovered in assuredly Byzantine contexts (at Corinth = ninth to twelfth centuries). I must emphasize that, so far as

I know, none were found in any medical context. Even so, the shape, size, and aesthetic detail of some of the pieces suggested to Professor Davidson that they may have been the property of Byzantine physicians. These pieces include:

1. Seven bifurcated instruments (nos. 1377–1383; fig. 1) the remnants of which range in length from 0.073 m. to 0.145 m. Decor consists of incised linear or circular patterns, in many cases on nicely turned shafts. Some of the pieces were probably inserted in wooden handles. These “forks” could very well have served to stretch wide wound openings in the removal of arrowheads, etc. (cf. Celsus VII, 5). They closely resemble items in the British Museum believed to have been used for this purpose.²
2. A simple probe (no. 1384; l. 0.073 m.; fig. 2). The shape of the piece somewhat resembles a probe in the British Museum (cf. L. J. Bliquez, “Greek and Roman Medicine,” *Archaeology*, 34 [1981], 17), and one in Mainz (cf. J. Hassel, Ernst Künzl, “Ein römisches Arztgrab des 3. Jahrhunderts n. Chr. aus Kleinasien,” *Medizinhistorisches Journal*, Band 15 (1980), 408, Taf. III, no. 10). Both date to the Roman Empire.
3. A spatula (no. 1385; l. 0.141 m.; fig. 3). Very likely there was an olivary enlargement on the broken end. The type is exceedingly common throughout antiquity (cf., e.g., Milne, 58–61 and Pls. XII–XIII).
4. Knife (no. 1386; l. 0.102 m.; fig. 4). A piece of great interest. It probably served as a lancet or phlebotome. While its particular triangular shape does not resemble that of any surviving Roman phlebotome, such angular designs are familiar from the manuscripts of Albucasis.³ For this reason the piece most likely is Byzantine, although Professor Davidson could not exclude the possibility that it is Roman.
5. Bronze instruments of unknown purpose (nos. 1387–1390; l. 0.107–0.09 m.; fig. 5). These are peculiar pieces in that the blades or spatulas are split at the ends. Decor consists of incised lines and circles and elaborately turned handles.

6. Bronze handle (no. 1391; l. 0.077 m.; fig. 6). On such a sturdy, well turned handle a medicament spoon or large spatula might have been mounted (cf. Milne, Pl. XIX, nos. 1–3).

B. A second group of objects to consider was once a part of the collection of the Russian Baron Ustinov and is believed to have come from Palestine and/or Syria. S. Holth, believing that most of these objects were surgical instruments, purchased them in Oslo in 1918/19, and, after studying them, published his findings in *Skrifter utgit av Videnskapsselskapet i Kristiania*, 1919 (I Matematisk-Naturvidenskabelig Klasse), 3–20 + Pls., I–IV. Altogether, Holth acquired thirty-five objects plus a balance or steelyard. Of these pieces some, he concluded, were Greco-Roman or even modern; these need not occupy us. There were also, however, a number of pieces which differed in shape and decor from Greco-Roman tools. These are:

1. Four bronze spoon spatulas (nos. 11–14; l. 15.8–7.5 cm.) decorated with twined patterns of an oriental character. One (no. 11) actually carries an inscription in Arabic, *Ati'akāb*, a Palmyrene proper name—apparently that of the owner or maker.
2. Six bronze double sounds with handles, square in section, centered at midshaft (nos. 16–21; l. 15.8–7.3 cm.).
3. A bronze remnant believed by Holth to be the handle for a cataract needle (no. 23; l. 7.5 cm.).
4. A silver knife handle (no. 35; l. 9.7 cm.; fig. 7). This piece features what look to be hunting scenes on both sides, and on both sides an inscription: Θές με, κλέπτα (“Put me down, thief!”) and κύριον ἔχω (“I have a master already!”)⁴

Holth argued that the hunting scenes are not good evidence that the piece was a hunting knife. At 9.7 cm. it is too small for that purpose but is of the proper size for a scalpel handle; and like so many surviving Greco-Roman scalpel handles it has lost its blade which, being of steel, has now rusted away.

²Cf. L. J. Bliquez, “Greek and Roman Medicine,” *Archaeology*, 34 (1981), 17; J. S. Milne, *Surgical Instruments in Greek and Roman Times* (repr. New York, 1970) (hereafter Milne), 83 and Pl. XXII.

³Cf. M. S. Spink and G. L. Lewis, *Albucasis on Surgery and Instruments* (Berkeley, 1973), chap. 46, figs. 88–90.

⁴Holth would restore κύριον and suggests (p.12) that the absence of ο shows that the engraver may not have been a Greek. The form κύρις is, however, attested: cf., e.g., Theophanes, *Chronographia*, ed. C. de Boor, (Leipzig, 1883), I, 673, 3, ὁ κύρις Βουλγαρίας.

The letters of the inscription could be as early as the third century but they could also be later.

In short, we seem to have here a number of pieces which postdate the Roman Empire. In my experience some instruments of the classical period from the outer reaches of the Empire have a provincial air,⁵ but Holth's pieces are rather more exotic. If, then, they are later, they must be Byzantine (especially the knife) or early Islamic. If the former, they will not be later than the seventh century, when Syria and Palestine were lost to the Arabs.

C. Finally, a number of objects in Cairo may be relevant. These consist of fifty-six pieces in the Coptic Museum, forty-three of them having been donated by Dr. Henri Amin Awad, who kindly called my attention to them and sent on photographs. Dr. Awad believes that these pieces qualify as Byzantine surgical instruments, and will soon set forth his views in a study which he is currently preparing on surgical instruments found on Egyptian soil. The collection in the Coptic Museum contains a rich variety of tools, including what appear to be probes (?), scoops and spoons, a chisel, scrapers, forceps, spatulas, a pair of shears, a retractor (?), and a container, perhaps for medicaments. Types vary considerably: some objects closely resemble pieces produced in the Roman Empire (for example, no. 3 below), some resemble pieces from Byzantine Corinth (for example, no. 4), some are similar to pieces published by Holth (no. 5), and still others are *sui generis*. A number of pieces are attractively turned and decorated with stamped or incised lines, concentric circles (already familiar from Corinth), and finials in the form of birds and the cross. I can supply no measurements, nor am I certain that all the pieces are of bronze. Some of the more interesting of these pieces are:

1. A probe (?) (no. 5219; fig. 8) decorated with stamped or incised circles on its shaft and surmounted by a cross.
2. A small chisel (no. 5009; fig. 9).
3. A "cyathiscomele" (no. 7278) which resembles many such pieces produced by the Romans.
4. A knife (no. 5759; fig. 10) rather like the triangular piece from Corinth (no. A, 4 above). It ap-

pears to have a three-pronged retractor at its other end. For a double retractor cf. R. Caton, "Notes on a Group of Medical and Surgical Instruments Found near Kolophon," *JHS*, 34 (1914), 115, IV and Pl. X, no. 16.

5. Eight double probes? (one bears the number 5240, the rest belong to the Awad collection) resembling six similar pieces published by Holth (cf. B, 2 above).
6. A gouge? (no. 1212; fig. 11) with a nicely turned shaft and a finial in the shape of a bird or cock.
7. A medicament container in the shape of a fish decorated with what appear to be floral motifs (Awad Collection).
8. Two probes (?) surmounted by finials in the shape of birds, one bird decorated with circles (fig. 12; Awad Collection).

Dr. Awad also calls my attention to what appears to be a probe with a finial in the shape of a cross in the Museum of Islamic Art, Cairo. I have no other information on this piece.

This is the material evidence for Byzantine surgery of which I am aware. It will be seen at once that without further discoveries, the material evidence surviving from the Byzantine period is not abundant. And, since it is so far impossible to demonstrate that many of these pieces are in fact surgical tools, or in some cases that they are even Byzantine, the evidence may even be called meager. This is disappointing in view of the rich survival of instruments of the Roman Empire. We must remember, however, that where the Roman Empire is concerned, we owe our good fortune to the practice which prevailed then of burying deceased physicians with their instrumentaria. Were it not for this practice (and for the chance eruption of Vesuvius in 79 A.D. which preserved the instruments in Pompeii), we would probably have very few instruments from the Roman Empire as well, and their function as surgical tools might also be disputed. It is worthwhile noting that among the Greeks of the Classical Period it was not the custom to bury instruments with the dead physician, as it apparently was not among the Byzantines. Thus, as there are few remaining instruments from Byzantine times, so also there are none known to me (with the exception of a few bleeding cups) from the age of Hippocrates, and few if any survivals from the fourth century B.C. and the ensuing Hellenistic Pe-

⁵See, e.g., L. J. Bliquez, "Roman Surgical Instruments in the Johns Hopkins University Institute of the History of Medicine," *BHM*, 56 (1982), 197-202.

riod.⁶ Perhaps, then, we should be grateful for such Byzantine remains as there are.

In any case, if it be conceded that a number of the objects presented here were employed by Byzantines as surgical tools (and I for one believe this), then we at least have a few samples from various times and locations.⁷ Based on these pieces it appears that in some cases Roman types and shapes were closely adhered to, even into the twelfth century, whereas in still other cases local preferences in shape and decor prevailed to a much greater degree than in Roman times. Perhaps factors like the looser composition of the Byzantine empire and its short life in some areas account for the variations.

II

If the material remains do not amount to much, neither, as I have stated, is one particularly impressed with the literary treatment of surgery by Paul's successors. For neither in the texts of the great handbook names nor in the pages of lesser authors is there anything to equal Paul's sixth book. For example, although Theophanes Nonnus deals with countless conditions in the medical encyclopedia which he composed in the tenth century, he has little to say about surgery, aside from references to cupping and bloodletting. Of the most significant authors of the eleventh century, Michael Psellus supplies only a few items of interest in his dictionary of diseases, in his medical poem in 1,373 trimeters, or in his other works; and Symeon Seth confines himself to investigating the properties of foods and herbs in his most important contribution. Finally, while John Actuarius in the fourteenth century wrote voluminously, he will be remembered far longer for his acute knowledge of the properties of human waste products than for anything he had to tell us about the surgical art.

Of all Byzantine medical authorities, the only one who supplies any extensive information about sur-

gery is the ninth-century figure Leon, the Learned Physician (ιατροσοφιστής). In his *Epitome of Medicine*⁸ there can be found references to over forty operations, and approximately fifteen surgical instruments and parasurgical items.

However, Leon almost never enters into any detail as to the actual mechanics of a particular operation; often enough he is content merely to mention in passing that conditions like hydrocele, cirsocele and various eye complaints are dealt with διὰ χειρουργίας.⁹ The same lack of attention to detail usually prevails when Leon refers to the actual instruments used in operations. For example, when the name of a specific tool within a class is desired, he often supplies only the generic term, for instance, καυτήρ as opposed to τριαינוειδὲς καυτήριον (Paul 6.48), μαχαιρωτὸς καυτήρ (Paul 6.42), πυρηνειδὲς καυτήριον (Paul 6.25), γαμμοειδὲς καυτήριον (Paul 6.62), μηνειδὲς καυτήριον (Paul 6.57), etc.¹⁰ Furthermore, Leon's surgery seems limited. Although he is willing to operate for tonsils, gangrenous uvula, the usual eye conditions, tumors, cysts, hemorrhoids, and fistula, and quite ready to cup and bleed for headache and female complaints, it is noteworthy that he does not mention surgery as a remedy for the treatment of empyema or bladder stone; and he is remarkably silent in other areas. He says nothing of the more adventuresome operations which appear in the Roman Empire and the Early Byzantine Period—mastectomy for example. He does not treat of weapons or tooth extraction or bone surgery or trephination or amputation of any type. Moreover, to read Leon one would think that all Byzantine women gave birth with ease, as he has no comment at all on problems which might confront the physician in this sphere. It cannot be argued that Leon does not discuss these topics because he disapproved of surgery as a remedy for them. In section III, xxi, for example, he asserts that prophyxis or symphysis of the eyelids is incurable, although some dare to operate for it. Clearly Leon sees no point to surgery for these conditions; the point is, he mentions it as an option exercised by some, nevertheless.

In short, although there is much to interest the student of surgery in Leon's *Epitome*, the fact remains that Leon simply pales in the presence of

⁶See E. Künzl, J. Hassel and S. Künzl, "Medizinische Instrumente aus Sepulkralfunden der römischen Kaiserzeit, *BjB*, 182 (1982), 125–26. V. Lambrinoudakis may have recovered some pieces of the classical period in the shrine of Apollo Maleatas; see his *Ἱερὸν Μαλεάτου Ἀπόλλωνος εἰς Ἐπίδαυρον, Πρακτ. Ἀρχ. Ἑτ.*, 1975:1, p. 175 with pl. 149; and *Ἀνασκαφή στὸ Ἱερὸ τοῦ Ἀπόλλωνος Μαλεάτα, Πρακτ. Ἀρχ. Ἑτ.*, 1976:1, p. 209 with pl. 148.

⁷I favor especially the probe and lancet from Corinth (A, 2 and 4 above) and the scalpel (B, 4 above) published by Holth. It is premature to pronounce on the pieces in Cairo.

⁸I have used the text in Ermerins.

⁹III, xl, xli; VI, xii, xiv.

¹⁰An exception: συριγγιακὸς καυτήρ (III, xxi).

Paul, his predecessor of two centuries before; and, as I have said, there is no other commanding literary presence in the field of surgery after Leon. Since, then, there seem to be few survivals of the surgical instruments used by Byzantine χειρουργοί, and since later Byzantine medical literature dealing with surgery is not nearly as impressive as earlier Byzantine work on the subject, one might be tempted to conclude that the state of surgery actually declined in the Byzantine world as time passed.¹¹ Fortunately, two documents which have previously received only limited attention now acquire considerable importance. As it turns out they are the best, if not the sole evidence, that this was not the case.

III

By chance, the documents to which I refer each contain a list of surgical instruments and paraphernalia. The oldest of the two lists, Codex Parisinus Latinus 11219, dates to the ninth century. Following the heading "Incipiunt ferramentorum nomina. Necesse est universorum ferramentorum nomina dicere ita," it supplies in some remarkably barbaric Latin spellings the names of sixty-six instruments, all of them Greek save two.¹² The more recent list occurs on Laurentianus gr. LXXIV 2, a manuscript of the eleventh century. After the title ὀνόματα τῶν ἱατρικῶν ἐργαλείων κατὰ στοιχεῖον ἃ ἐν ταῖς χειρουργαῖς χρῶμεθα it provides (in more or less alphabetical order) eighty-nine entries, all in Greek. Both of these lists were published together for informational and comparative purposes by Hermann Schöne in 1903.¹³ At that time Schöne did not inquire into the origins of either list. He merely stated his opinion that they derived from independent sources because, although both often name the same instruments, in many cases one list gives the diminutive while the other does not; and of course there are numerous instances in which one list supplies a name omitted by the other. For our purposes, however, it is necessary to speculate on the circumstances under which these lists might have been created and perpetuated, and the time when this occurred.

Lists of surgical instruments and attendant par-

aphernalia in Greek can be found at least as early as Pollux (second century A.D.),¹⁴ and lists or glosses in Latin at least as early as Isidor of Seville (ca. 560–636).¹⁵ These lists, however, are nowhere near as comprehensive (Pollux, twenty-two names;¹⁶ Isidore, 12¹⁷) as those being considered; furthermore, they do not exist independently, but are included in works on a variety of subjects circulated under the name of an author. Schöne's lists, on the other hand, have about them the air of simple inventories or checklists detailing the surgical apparatus respectable medical establishments might be expected to have on hand. For example, they seem perfectly at home in the carefully detailed atmosphere of establishments like the famous hospital of the Pantocrator monastery, the *Typikon* of which enumerates the interesting responsibilities of the ἀκονητής or "sharpener":

He must keep clean all of the surgical instruments which are stored in the ξενῶν and used for operations on the sick. For there will always be stored in the ξενῶν itself lancets, cauterizing irons, a catheter, a tooth forceps, instruments for the stomach and head, and in short those (instruments) necessary for all operations. Furthermore, there shall always be on hand bronze wash basins of every type in which the physicians can wash themselves after treating the patients in a manner suitable to the care of each.¹⁸

In view of the affinity between Schöne's lists and this passage from the *Typikon*, I suggest that these documents may have originated as checklists on the basis of which functionaries like the ἀκονητής secured and maintained the surgical equipment of Byzantine hospitals and clinics.

As it now stands, the list in Latin letters is probably no more than the bookish compilation of someone in the West who tried to assemble the names and (less successfully) proper transliterations ("necesse est . . . dicere ita") of as many ("universorum") instruments as he could.¹⁹ His list,

¹⁴ See *Onomasticon* 10, 149 (Bekker edition); see also St. John Climacus, *Liber ad pastorem*, PG, 88, cols. 1168–1169.

¹⁵ *Etymologiarum*, IV, XI, 1–7.

¹⁶ σμίλη, ὑπογραφίς, ὠτογλυφίς, ψαλίς, μηλωτρίς, μήλη, ὀδοντοξέστης, ὀδοντάγρα, ἐξάλειπτρον, λουτήριον, σικύα, ὑπόθετον, λεκανίς, σπογγία, ἐπίδεσμα, σπλενίον, λαμπάδιον, ποδοστράβη, κλυστή, βάλανος, ῥάκια, κηρωτή.

¹⁷ *Phlebotomum*, *smiliaria*, *angistrum*, *spatomele*, *guva*, *cucurbita*, *ventosa*, *clistere*, *pila*, *pilum*, *mortarium*, *coticula*.

¹⁸ P. Gautier, "Le Typikon du Christ Sauveur Pantocrator," 1270–1280, in *REB*, 32 (1974), 1–145 (see 105).

¹⁹ I had entertained the notion that the Latin list had in some way to do with the foundation or improvement and maintenance of the surgical instrumentarium for a hospital or clinic in

¹¹ This may be the view of Mario Tabanelli, who in his *Studi sulla Chirurgia Bizantina* (Florence, 1964) confines himself to Paul.

¹² *Acus*, *auriscalpium*.

¹³ "Zwei Listen Chirurgischer Instrumente," *Hermes*, 38 (1903), 280–84.

however, obviously depends on a Greek original which, like the eleventh-century list and its antecedents, very probably had a practical (ἃ ἐν ταῖς χειρουργίαις χρῶμεθα) end in view. Thus my suggestion that both lists originated as checklists in Byzantine times.

To support this position we must ask when Schöne's lists were first compiled, assuming that both are copies of earlier documents. In view of their extensive detail it is clear that they must be later than Pollux and Isidore. A more significant point is that, between them, the two lists attest to approximately thirty-two names which, to the best of my knowledge, are not found in Paul or before.²⁰ Of these thirty-two names, nine occur in both lists, nineteen only in the Greek list, and four only in the Latin list. Now a few new terms might not amount to much, but the occurrence of thirteen new names in the Latin list seems to me to constitute reasonably strong grounds for contending that its original was created well after Paul's time; and this is even more obvious in the case of the Greek list, which features twenty-eight new names. It is quite probable then that these lists date to well into the Byzantine period and are not copied from classical originals. So, in terms of their chronology at least, nothing prevents the lists from being associated with Byzantine hospitals.

The most important consideration, however, is this. Whether the lists have anything to do with hospitals or not, unless—contrary to received opinion—the Byzantine medical profession was given over to antiquarian pursuits, the very fact that lists of surgical gear were being copied out by Byzantines in the ninth to eleventh centuries should mean that their contents were then important in a practical sense, that is, that the items detailed in the lists were actually in use (ἃ . . . χρῶμεθα) at the time each was composed. If this is true, then it must also be the case that if there existed in the ninth to eleventh centuries instruments which were employed for operations centuries earlier, the same operations must also have been performed for the

most part in this period. To be sure, this is less certain in cases where a generic instrument is attested, for example, μαχαίριον or scalpel, since this type of instrument was used in any number of surgical procedures. In the case of specific types, however, such as ἀντιστόμον (tonsil knife), ἐμβρυοτόμον (embryo knife), λιθοτόμον (bladder stone knife), πτερυγοτόμον (pterygium knife), σταφυλοτόμον (uvula knife), συριγγοτόμον (fistula knife), βλεφαροτόμον (eyelid knife), and κατιάς (a type of phlebotome), we are on a firmer ground; and a significant number of the instruments on the lists are of this type. Thus, as I have stated, Schöne's lists are a tremendously important factor in determining the state of surgery in the ninth to eleventh centuries; for they show, as Leon, Theophanes Nonnus, Michael Psellus, and Symeon Seth do not, just how enterprising the surgeons of the Middle Byzantine Period were, at least in some places at some times.

And indeed the lists offer a full repertoire of surgical tools. As previously noted, there are knives of all types: special models for excision of polyp, tonsil, uvula, pterygium, and fistula, in addition to colorless generic names like μαχαίριον or σμίλη. And there are listed the λιθοτόμον or knife for excision of bladder stone, and surgical scissors. Probes abound on the lists, which feature, in addition to the generic term μήλη, specific types such as those with double olivary enlargement, the ear probe and the spatula probe. There are retractors and various needles; the tongue depressor is mentioned. There are forceps of all types, those for eye work, those for gripping various types of tissue, and heavy-duty models for bone and teeth. There are all sorts of other bone and tooth instruments listed: drills, trephines, saws, chisels, guards, levers, files, scalers, and impellents for weapons extraction. One could be as easily purged to distraction in the ninth to eleventh centuries as in the time of Oribasius, since clysters occur on the lists in profusion; and all the specialized tubes needed for drainage and extraction are attested—for instance, the cannula and the pus extractor. Byzantine mothers in difficult labor who were ignored by Leon could hope for some assistance at the appearance of an ἰατρός equipped, as the lists direct, with uterine dilators, various specula, embryo hooks, the cranioclast, and special bodkins and knives for the destruction and excision of an impacted fetus. In addition to various accoutrements and aids to surgery, the lists also provide approximately twenty-five names of objects whose identity is doubtful. In some cases names appear to be hopelessly corrupted. In the cases

the West. Owing to the skillful arguments of Prof. Baader, I have abandoned this view.

²⁰ ἀντιβολάδιον / *antiboladium*, ἀντόπτρα, ἀ(πο)ξυστήρ, βλεφαροτόμον, βούγλωσσον, γραμμιστήρ / *grammister*, ἐθειρόλογος, ἐντε(ρο)φύλαξ, ἐπικρούστιον, κέστρος / *cestros*, καυλοκυστήρ, κυνορράφιον, λεπτάριον, λεπτομήλη, μασχαλολαβεύς / *mascalolabeos*, μητρανύκτης, ὀστεγχύτης, ὀστανалаβεύς, ὀφθαλμοστατήρ / *ostalmostater*, παραστολεύς / *parastoleus*, περιλαβεύς / *peribabeos*, πλευροπριστήρ / *pleioprister*, πρασία / *prasia*, ὀνινοσπάδιον, σκυθομήλη, σκηνορράφιον, σταφυλολαβίς, ὑπερβιβαστήρ, *epibastes*, *cefaloclases*, *deltarium*, *ostanaboleos*.



1. Seven Bifurcated Instruments

Corinth Museum (American School of Classical Studies)



2. Simple Probe



3. Spatula



4. Knife



5. Four Bronze Instruments of Unknown Purpose



6. Bronze Handle

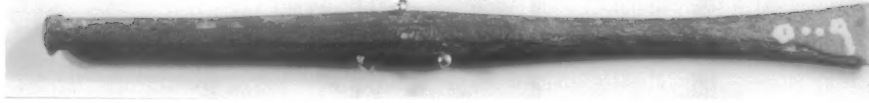
Surgical Instruments from Corinth



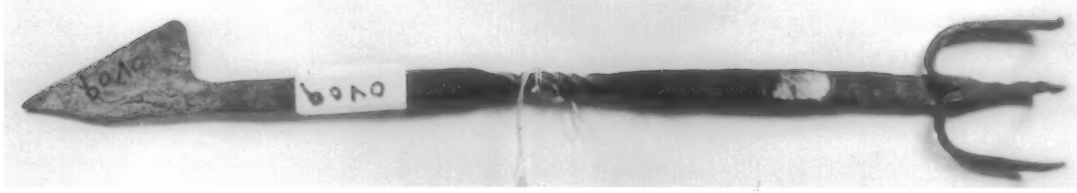
7. Silver Knife Handle.
Present Location Unknown.
Formerly in Collection
of S. Holth



8. Probe (?)



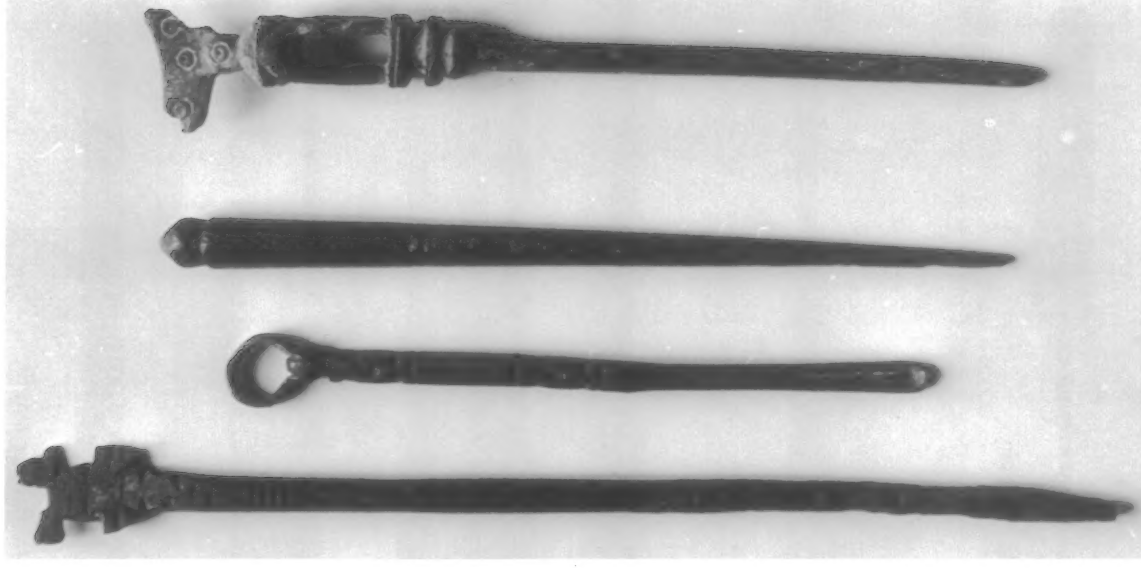
9. Small
Chisel



10. Knife



11. Gouge (?)



12. Four Probes

Cairo, Coptic Museum. Surgical Instruments from Egypt

where they are not corrupted, we can sometimes make a good guess as to the identity of an instrument (see Appendix I below). In sum, the lists detail almost every instrument known to Paul and his predecessors—with two remarkable exceptions. Nowhere is there any reference to the bleeding cup, and it is likely that the cautery too is omitted. Certainly the generic *καυτήρ* or *καυτήριον* does not occur in the case of the latter. Possibly dubious terms like *βούγλωσσον* (instrument shaped like an ox tongue), *deltarium* (delta-shaped instrument?) or *fenicus* (if = a wedge-shaped cautery attested by Hippocrates) refer to cauterizing instruments; but we cannot know. If no cauteries are attested, as certainly seems to be the case with bleeding cups, that is indeed cause for surprise. Perhaps the lists do not contain such instruments because they were too common to deserve mention. In any case, their existence in this period cannot be doubted because they are abundantly attested in other sources.²¹

To repeat, the two lists we have discussed are the firmest evidence at hand that most of the major surgical tools employed by Paul and his predecessors (and therefore most of the operations for which they were employed) were in use from at least the Macedonian dynasty through the Comneni. It appears, therefore, that the state of surgery did not decline significantly in the Middle Byzantine Period. It may be that in some respects it even advanced a bit. Certainly the surgeons of the capital did not seem reluctant to undertake operations previously unattested. One such spectacular operation took place in the tenth century when, in the reign of Constantine VII Porphyrogenitus, Siamese (actually Armenian) twins connected at the upper abdomen were separated after one of them had died. The operation was not a success, however, as the remaining twin died three days later.²²

But it is probably unwise to conclude that there was any significant change in the state of surgery. My feeling is that things probably stayed about the same as in Paul's time; so, there was no subsequent author among later Byzantines to eclipse him.²³ For this reason the critical acumen of one Nicetas, who sometime between the ninth and early twelfth centuries extracted from the surgical chapters of

Paul and a few of his predecessors, is to be commended.²⁴ Only the lists, however, show to what extent all the operations detailed in Paul were still practiced.

It is commonly said that in the sciences the Byzantines originated little but passed on a great deal. If so, my own investigation into Byzantine surgery seems to bear out this conclusion.

IV

A few final observations on the conditions under which surgery was practiced in Byzantine times are in order.

It appears that dissection of the human body was practiced continuously, so that surgeons were directly acquainted with the anatomy. [St. Eustathius of Antioch] attests to the practice in the fourth century, noting that the bodies of condemned criminals were used for the purpose.²⁵ There is one grim account of actual vivisection in the reign of Constantine V Copronymus. Under the year 765 Theophanes chronicles the arrest of one Christianus, prince of the Scamari, who (apparently for religious deviations) was given over to physicians who dissected him alive on the mole of St. Thomas in the capital.²⁶ Finally, autopsies performed by physicians on corpses are mentioned by St. Symeon the New Theologian around the turn of the eleventh century, and George Tornices describes them in the twelfth.²⁷ It is doubtful that these exercises resulted in new knowledge about the human anatomy; at least so one gathers from the anatomical treatises that survive from the Byzantine Period. On the other hand, if, as I argue, Byzantine surgery did not slide backwards, I think it very likely that autopsy was a key factor in preventing decline. Contrast the situation in the Latin West, where autopsy was abandoned and where the decline of surgery through the Middle Ages is well known.²⁸

²⁴F. Kudlien may have had the last word. He argues for the tenth century; *Die handschriftliche Überlieferung des Galenkommentars zu Hippokrates, De articulis* (Berlin, 1960), 11 ff.

²⁵[Eustathius], *Spuria, Comment. in Hexaemeron*, PG, 18, cols. 788–789.

²⁶Theophanes, *Chronographia* (ed. C. de Boor [Leipzig, 1883], I:436, 16–21.

²⁷Syméon le Nouveau Théologien, *Traites théologiques et éthiques*, ed. J. Darrouzès (Paris, 1967), vol. 2, 138–40; Georges et Demetrios Tornikès, *Lettres et discours*, ed. J. Darrouzès (Paris, 1970), 225. I am indebted to Prof. Alexander Kazhdan for these references.

²⁸A. Kazhdan and I will discuss these passages and the conclusions drawn from them more fully in a future issue of the *Bulletin of the History of Medicine*.

²¹See Appendix II below, s.vv. *καυτήρ*, *σικύα*.

²²See G. E. Pentagalos and J. G. Lascaratos, "A Surgical Operation Performed on Siamese Twins during the Tenth Century in Byzantium," *BHM*, 58 (1984), 99–102.

²³And of course the Persians and Arabs, who were influenced by the Greeks, owed much to Paul but not later Byzantine surgeons.

For those who had lost limbs it is clear that artificial substitutes were available, as was the case in the Classical Period.²⁹ Whether these limbs amounted to more than peg legs and hooks for hands is not certain; but, as the Byzantines were clever workmen, it seems quite possible that some of their artificial productions would have been not only functional, but fashioned to resemble the lost part.³⁰

Although modern antiseptics were of course unavailable, Byzantine surgeons seem to have attempted to observe elementary rules of sanitation, donning aprons and towels for operations and employing sponges and tepid water in the course of them. Care was also taken to see that operations were conducted in favorable temperatures.³¹

There are frequent testimonia to operations performed in public, the physicians creating a kind of operating theater out of the attending crowd. Various motives are adduced for this practice. St. John Damascene thought that the physicians were anxious to demonstrate how science overcomes disease;³² John the Faster speculated that the on-lookers might be moved to contrition by observing the sufferings of others;³³ and St. John Chrysostom asserted that by witnessing the misfortunes of others we might become inclined to protect our own health, in particular our spiritual health.³⁴ St. John Chrysostom appears himself to have been particularly inspired by such spectacles, as he leaves be-

hind the most detailed description of them; and he gives good reason for supposing that general anesthesia was no more widely used in his time than it had been earlier.³⁵ "At these operations," he says, "you can see the flesh being cut, the blood flowing, gangrene being removed; and one has to endure a good deal of unpleasantness arising from the spectacle and a good deal of pain and grief, not only from the sight of the wounds but also from the suffering of those being cauterized and cut. For no one is so made of stone that, as he stands by those undergoing these operations and hears their cries (ὀλουζόντων), he does not break down, feel troubled, and become despondent in his soul."³⁶

As the surgical gear of the Classical Period is remarkable for the aesthetic care lavished on it, so too such surviving Byzantine tools as appear to have been used for surgical purposes are, in many instances, carefully turned, decorated with various motifs, and are sometimes made of precious metals. In the second century the satirist Lucian of Samosata complained that quacks enticed the naive with such fancy equipment;³⁷ but for competent physicians, there must be another explanation. In a period when there were few antiseptics and little if any anesthesia, all surgery—no matter how accomplished the surgeon—must have been extremely painful and downright dangerous. Attractive instruments must have helped surgeons as they attempted to inspire confidence in their patients, just as nowadays we relax a little when the dentist has one of those new "painless" drills. We can therefore be thankful that, however advanced surgery had become in the time of Paul of Aegina and his successors, we ourselves have the good fortune to live in modern times.

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²⁹See R. Guillard, *Correspondance de Nicéphore Grégoras* (Paris 1927), 193.

³⁰At least one such limb survived classical antiquity, the famous Capua leg of ca. 300 B.C. Unfortunately, it was destroyed in 1941 when the Museum of the Royal College of Surgeons in London was bombed. See W. R. Brunn, "Der Stelzfuss von Capua und die antiken Prothesen," *SA*, 18 (1926), 351–60 and L. J. Bliquez, "Classical Prosthetics," *Archaeology* (1983) 25–29.

³¹St. John Climacus, *Liber ad pastorem*, PG, 88, col. 1169; Διήγησις τῶν θαυμάτων τοῦ ἁγίου Ἀρτεμίου (*apud* A. Papadopoulos-Kerameus, *Varia Graeca Sacra* (St. Petersburg, 1909), 41, 20; *idem* (ed.), Ἐξηγήσεις ἡτοιμασθέντων τῶν ἁγίων πατέρων . . . , *Pravoslavnij Palestinskij Sbornik*, 19, 3 (1907), 31–32.

³²*Sacra parallela*, PG, 96, col. 121.

³³*Sermo de poenitentia*, PG, 88, col. 1973.

³⁴*Ecloga de adversa valetudine at medicis*, *Homil. XIII*, PG, 63, col. 656.

³⁵See Celsus VII, Prooemium, 4, and Hippocrates, *Haem.* 2, both of whom mention the cries of the patients.

³⁶*In paralyticum demissum per tectum*, PG, 51, col. 55.

³⁷*Ind.* 29; cf. also St. John Damascene (*Sacra parallela*, PG, 96, col. 61), who may have Lucian in mind.

APPENDICES³⁸

APPENDIX I

NOTES ON SCHÖNE'S LISTS

When Schöne published the two lists together in 1903 he wished merely to present the names which they contained and to correct spellings, sometimes using one list against the other for this purpose. He did not attempt to identify the names on the list with putatively surgical instruments which had been recovered from excavations and chance finds, but specifically left this work to others. In 1907, there appeared the standard work on Greco-Roman surgical gear, J. S. Milne's *Surgical Instruments in Greek and Roman Times*. In his book Milne attempted to match surviving objects with names and descriptions in Greek and Roman medical texts from Hippocrates to Paul. However, not every name for the instruments of the Classical and Early Byzantine Periods can be found in Milne; and of course Milne made no attempt to collect the terms used in later Byzantine times. It seems worthwhile, therefore, to provide here information about those items on the lists which are not included in Milne, or about which some comment is warranted for one reason or another. I do this following the order of the names in Schöne's publication.

While no name ever occurs twice on either of the lists, it does appear that in a few cases two different names for the same instrument can be found.³⁹ These instances, however, are few in number. Therefore, in attempting to identify a name, I have generally assumed (unless I had good reason to believe otherwise) that it does not duplicate other items on its list.

ἄγκιστρα / angistrum

Milne certainly includes the term, identifying it as a sharp hook or retractor, many examples of which survive (see App. II below, *s.v.*). Noteworthy here is the fact that the eleventh-century list uses the plural, probably because these tools were so often used in quantity that they were frequently referred to in the plural (cf., e.g., Paul 6.35, 37, 39). Cf. also ῥαφίδες below.

ἀκμάδιον

The name was dubious to Schöne, who seems to have entertained ἀκονάδιον or "little whetstone," the emendation of Dietz, a previous editor. But Ps.-Moses (M.

Bertholt, *Collection des anciens alchimistes grecs* [Paris, 1888], p. 39 B) attests to ἀκμάδιον as a conical crucible; and, as there are a number of parasurgical items on the lists (e.g., πύαλος, *incliridium*), this interpretation is preferable to an emendation which is, as far as I can see, completely unattested in the literature.

ἀντιβολάδιον / antiboladium

Otherwise unattested. That the term is a diminutive of ἀντίβολον (= copy, transcript), from ἀντιβόλω, is impossible. Very likely it derives from ἀντιβάλλω, which occurs in Palladius, in *Hip. Fract.* 12.285c (in R. Charterius, *Hippocratis et Galeni Opera*, Vol. XII [Paris, 1679]) in the sense of "put back protruding bone." Thus the instrument would be a type of bone lever; cf. ἀναβολεύς, μοχλίσκος, App. II below, *s.vv.*

ἀντιστόμον / antiothomum

A tonsil knife, see Galen (ed. Kühn), 14.785.

ἀντόπτρα

Otherwise unattested. All similar terms have to do with instruments used to dilate the rectum and the female genitals, e.g., διόπτρα, κατοπτήρ. I have not encountered the latter in a Byzantine text, so perhaps it was replaced by ἀντόπτρα; cf. διαστολεύς below.

ἄ(πο)ξυστήρ

Otherwise unattested. A type of raspatory, cf. περιξυστήρ below.

βλεφαροτόμον

Otherwise unattested. Obviously a small scalpel for work on the eyelid. Very likely therefore the ἀναραφικόν σμιλίων, which is attested for work on a variety of eye conditions, but does not occur in the lists (see App. II below, *s.v.*)

βούγλωσσον

Otherwise unattested. LSJ would make it a tongue depressor, but the name is equally suggestive of other instruments (e.g., a cautery) and the γλωσσοκάτοχος or tongue depressor is already included on the eleventh-century list.

γραμμιστήρ / grammister

Otherwise unattested. Galen (ed. Kühn), 2.673 uses the word γραμμή in the sense of the edge of a knife, so a kind of scalpel could be meant. But, more likely than not, we have here an instrument for making a line, a γραφίον therefore or stylus. These were used for various surgical procedures (see Milne, 72–73).

διαστολεύς

For Milne (81–82, 150) this term meant only uterine dilator or vaginal speculum. Paul, however, clearly intends by διαστολεύς a rectal speculum (6.78); and, since this is the only other occurrence of the word which I have encountered in a Byzantine text, I believe that is what we should understand here.

ἐθειρόλογος

Otherwise unattested. A tweezer for plucking hairs

³⁸ In the appendices the following abbreviations and editions have been used: Galen = ed. Kühn, cited by volume and page; Orib. = ed. Raeder, *Oribasii Collectionum Medicarum*; Aetius = ed. A. Olivieri, *Libri Medicinales V–VIII*; Psellus, Πότῃμα ἰατρικόν, in Ideler, I, 203 ff.; Michael Italicus, *loc. cit.* = Michel Italikos, *Lettres et discours*, ed. P. Gautier (Paris, 1972), p. 114, 11. 20–25; M–S = T. Meyer-Steineg. *Chirurgische Instrumente des Altertums* (Jena, 1912); S (9th and 11th) = The ninth and eleventh century lists edited by H. Schöne (see note 13 above); *Varia Graeca Sacra* (see note 31 above); *Typikon* (see note 18 above). For the editions of Paul and Leon, see notes 1 and 8 above.

³⁹ ἐθειρόλογος—τριχολάβον (epilation tweezer), ὁστανάλαβός—ὁστάγρα (bone forceps).

(ἔθειρα), probably in treatment of granular ophthalmia. If so, the instrument is the same as the τριχολάβον which is also included in the eleventh-century list.

ἐνετήρ

Widely attested as a type of clyster: see Cassius Felix 48; Alexander Trall. 8.2; Severus, περὶ ἐνετήρων (title); Stephanus, *In Galenum, in Hippocratem* 1.331 D.

ἐντε(ρο)φύλαξ

Otherwise unattested. An analogy is provided by the μηνιγγοφύλαξ, an instrument generally used to protect membranes during surgical operations on bone (see Milne, 126 and Pl. XL, 3). Thus, the present piece should be some sort of plate which, to judge by its name, was especially designed to protect the inner parts of the abdomen while, e.g., a rib was being sawed through. It is worthwhile noting that Paul mentions sawing operations on ribs (6.77, 96), though he only mentions the μηνιγγοφύλαξ in connection with them. It should also be noted that a special rib saw seems to have been developed by the Middle Byzantine Period (see πλευροπριστήρ below).

ἐπικρούστιον

Otherwise unattested. Perhaps a hammer (cf. ἐπικρουστήριον *s.v.* in the *Corpus Glossariorum Latinorum*) and indeed the hammer is not elsewhere attested on the lists. Very likely, however, we are dealing here with a type of phlebotome; cf. φλεβοτόμον ἐπικρουστικόν (Aetius 6.8) which may be the type of phlebotome figured in Milne, 35 and Pl. VIII, 3.

κέστωρ / cestros / κέστρος

Otherwise unattested as a surgical instrument. Entries in LSJ include a serrated tool for encaustic painting (Pliny, *N.H.* 25.84), a bolt shot from a catapult (Polyb. 27.11.1; Dion. Hal. 20.1.1) and roughness of the tongue (Hsch., *s.v.*). This seems therefore to be a shaftlike instrument with a roughened surface. Perhaps, then, it is a kind of file (although the file, ῥινοτορίνιον, is included on the lists) or even something like a screw probe, at least one sample of which survives and the name for which is unknown (see Milne, 68 and Pl. XXI, 5).

καυλοκλυστήρ

Otherwise unattested. Obviously a type of clyster. The noun καυλός may be descriptive of the instrument ("stem," "stalk"), or more probably of its function. Under the meanings of καυλός LSJ also lists the urethra, the penis itself, and the cervix. This instrument is therefore likely to be a clyster for irrigation of the genital passages.

κυνορράφιον

Otherwise unattested. Obviously a type of needle, cf. σκηνορράφιον, ῥαφίδες below. LSJ takes κυν- as = *frenum praeputii*. If so, a special needle for stitching the prepuce. Operations on the prepuce are described by Oribasius (50.3) and Paul (6.54), but no needle is mentioned.

λαβίς

Attested as a forceps in Hippocrates (*Steril.* 244) and Galen (ed. Kühn, 12.659). The former describes it as λεπτοτάτη and the latter uses it to extract objects which have fallen into the ear canal. So a small slender type of tweezers is meant.

λεπτάριον

Otherwise unattested. A small and slender instrument, to judge by its name. Some cauteries are called λεπτόν (see App. II below, *s.v.* καυτήρ) as is the λαβίς (above) and the λεπτομήλη (below). Unfortunately, the possibilities are too numerous for an intelligent guess.

λεπτομήλη

Otherwise unattested. The name indicates that it is a "fine probe," very likely of the type designated as ἀπυρηνομήλη, i.e., a simple shaft without the usual olivary enlargement.

μασχαλολαβεύς / maschalolabeos

Otherwise unattested. A type of forceps (λαβίς, -λάβον) for gripping the arm pit (μασχάλη) seems pointless. Some instruments of reduction were designed to support the arm pit (cf. App. II below, *s.v.* ὑπερόν, ἄμβη), and this may be what we are dealing with here.

μητρανύκτης

Otherwise unattested. Perhaps a speculum, but the διόπτρα already occurs on the eleventh-century list. I lean toward uterine dilator. διαστολεύς, which was one of the terms used for such an instrument in the classical period (see Milne, 81–82) does occur on the list but only, I think, in the sense of "rectal dilator" (see above). So perhaps this new term was evolved to identify the uterine dilator.

ὀξεῖα

Surely a scalpel; cf. Paul 6.86, ὀξεῖα σμίλη.

ὀξυλαβίδιον

The ὀξυλάβη is attested as a kind of tongs, cf. *Suda, s.v.* Ἥφαιστος. The present piece therefore would be a small forceps.

ὀδοντοξύστης / odontoxister

A tooth scaler; cf. Pollux IV, 181; Milne, 138.

ὀστεγχύτης

Otherwise unattested. On the analogy, of μητρογχύτης and *ostemquites* (see App. II below, *s.v.*). The name should mean "bone irrigator" rather than an "irrigator made of bone."

ὀστανάλαβεύς

Otherwise unattested. Apparently the same as ὀστάγρα ("bone forceps"), which also occurs on the eleventh-century list.

ὀφθαλμοστάτης / ostalmostater

Otherwise unattested. An eye instrument; an eyelid retractor? (see Paul 6.21; M–S, 41–42 and Taf. VIII, 6, 7).

παραστολεύς / parastoleus

Otherwise unattested. I suggest that a blunt hook or retractor (τυφλάγκιστρον) is meant on the basis of Galen (ed. Kühn), 2.523 (παραστέλλον την γαστέρα) and Oribasius 45.6.6 (τυφλαγκιστροις μεγαλοκαμπέσι παραστέλλειν). The term τυφλάγκιστρον seems unattested after Paul, so perhaps παραστολεύς replaced it.

περιξύστης / perixister

Not in Milne, but elsewhere attested as a rugine for scraping bone; cf. e.g., Oribasius 46.11.29.

περιλαβεύς / peribabeos

Otherwise unattested. If not a forceps, perhaps an instrument of reduction.

πλευροπρίστηρ / plioprister

Otherwise unattested. A rib saw. Ribs were sawed out in several operations (Paul 6.77, 88; Celsus VII, 4); see also έντεροφύλαξ above.

πολυ(πο)σφάκτης

Otherwise unattested. Possibly a knife to deal with polyp (cf. έμβρουσφάκτης, App. II below, *s.v.*), but then the instrument would probably be the same as the έιννοσπάθιον below. Another possibility is that the term = πολυποξύστης, a combination rugine/forceps for removal of polyp (see Milne, 93–94). This alternative is preferable because the πολυποξύστης does not occur elsewhere on the eleventh-century list, but does show up on the ninth-century list (*olipoxister*). So also LSJ.

πρασιά / prasia

Otherwise unattested. One can only guess. Many instruments draw their names from vegetables, fruits, etc., e.g., βάλανος, διπύρηνον, σικύα, φακωτός. If this instrument derives its name from the leek (πράσον), it might be, e.g., some sort of knife or dissector if an analogy is drawn with its leaves. On the other hand we might have here a ladder-like instrument of reduction (Hipp., *Art.* 42, 78) the shape of which suggested a bed of leeks (πρασιά).

πύαλος

Not found among the *étui* treated by Milne. A trough or bathing tub in which surgeons bathed patients after surgical treatment of enterocoele (Paul 6.65).

ράφιδες

One of two items occurring in the plural on the lists (cf. άγκιστρα). Perhaps needles for suturing tissues (cf. Paul 6.107, ράφαξ) as opposed to bandages. See Milne's discussion (pp. 74–75).

έιννοτορίνιον / rinotorine

Milne has έινάριον, έίνη, and έίνιον; the present spellings are otherwise unattested (and may therefore be corruptions (so LSJ)). In any case, a surgical file seems intended.

έιννοσπάθιον / rinuspatorium

Otherwise unattested. The σπαθίον is a knife (see App. II below, *s.v.*); so the present piece would be a scalpel for work on the nose, probably a πολυπικόν σπαθίον.

σαλπιν

"Fraglich" in Schöne's view. I believe that σαλπίνγιον or "bellows" is meant. Galen in his treatise on anatomical operations (ed. Kühn, 2.717) mentions the device which he compares to οί των χρυσοχών φυσητήρες. Now a smith's bellows was used to treat volvulus (see Milne, 108) so it is not at all out of place on a list of surgical instruments. And indeed the ninth-century list includes the *fisiter*.

σαρκολάβον / sarcolabon

A tumor forceps (see App. II below, *s.v.*). The classical name, μύδιον, does not occur on the lists.

σάφων

Drainage tube for hydrocele; see Galen (ed. Kühn), 10.988.

σκυθομήλη

A probe (μήλη) of some sort but what σκυθ- stands for is anyone's guess.

σκηνορράφιον

Cf. κυνορράφιον. A needle of some sort. If σκην = σκύνιον (skin above the eyes, Pollux 2.66), then perhaps a fine needle for suturing in this area.

σταφυλολαβίς

Another name for σταφυλάγρα; see App. II below, *s.v.*

τετραπίαλος / tetrafixos

"Fraglich," according to Schöne. A four-part trough? Cf. πύαλος.

ύπερβιβαστήρ

Cf. *epibastes*. An instrument of reduction?

fenicus

Schöne suggests σφηνίσκος is meant. If so, the term commonly designated a wedge or a pledget in Byzantine times (see App. II below, *s.v.*). It is once used by Hippocrates in the sense of a wedge-shaped cautery (Milne, 119).

ostanaboleos (όσταναβολεύς)

Otherwise unattested. The same as the άναβολεύς or bone lever. Perhaps the compound came into use to distinguish the bone lever from (assuming they were different) a lever used to remove sling bullets which was also called άναβολεύς (Paul 6.88.9).

malium

"Fraglich," according to Schöne. I guess = μήλιον or "small probe," although this name is not attested in the literature. Note that the eleventh-century list has λεπτομήλη, which would mean the same thing.

cefaloclases (κεφαλοκλάστης)

Otherwise unattested. A cranioclast. The eleventh-century list has έμβρουσθλάστης.

epibastes (έπιβιβαστήρ)

Cf. ύπερβιβαστήρ above.

incliridium

If = έγχειρίδιον, as Schöne suggests, then a type of instrument case; see *Isidore, Etym.* IV, XI, 1 and Milne, 168–70 who, however, supplies no name.

nasticium

If = νασθήκιον, then a splint (see App. II below, *s.v.*)

deltarium (δελτάριον)

A delta-shaped instrument. A cautery?

APPENDIX II

A PRELIMINARY LIST OF BYZANTINE SURGICAL INSTRUMENTS AND PARASURGICAL ITEMS

As I prepared this study, I took care to note down the names of surgical instruments and related gear which I encountered in Byzantine medical texts. These I present here in alphabetical order with references to illustrations of the Classical Period whenever possible. I do not pre-

tend that I have discovered every name or that I have listed all textual references to those names which occur here. Even so, I do not believe that many names or important references have been omitted. For this reason it seemed to me that such a list might be of use, especially as I know of no other such list available to students of Byzantine medicine.

ἀβάπτιστον (*sc.* τρύπανον)

Drill with collar guard. Paul 6.90. See Milne, Pl. XLII.

ἄγκιστρον / angistrum

Sharp retractor/hook. Orib. 44.8.1 *et passim* (50.48.6 = τυφλάγκιστρον); Paul 6.5 *et passim* (6.18, ἄγκ. μικροκαμπές); S (9th and 11th). Cf. κερσουλκός, τυφλάγκιστρον. See Milne, Pl. XXIV.

ἄγκη

A suture if not a clamp (see Milne's discussion, pp. 162–63). Paul 6.107.

ἄγκυλότομον

Tonsil knife. Paul 6.30, Cf. ἀντιστόμον. See M–S, Taf. IV, 12.

αἰγίλωπικὸν καυτήριον

Cautery for treating aegilops. Paul 6.22.

αἵμαρροϊδοκαύστης

Caustic forceps for hemorrhoids. Paul 6.79. See Milne, Pl. XXXII, 2.

ἀκανθοβόλος

Pharyngeal forceps. Paul 6.32. See Milne, Pl. XXXII, 1.

ἀκίς

Needle. S (11th).

ἀκμάδιον

Conical crucible (see App. I above, *s.v.*). S (11th).

ἄμβη

Instrument of reduction. Paul 6.114.

ἀμφισμῶλη

Probe with olivary enlargements. Michael Italicus, *Lettres et discours*, ed. P. Gautier, (Paris 1972), 114. Cf. διπύρηνον. See Milne, Pl. XI, 1.

ἀναβολεύς

Bone lever, Orib. 45.6.6 (ἡ καμπὴ ἀναβολέως). Lever for extracting weapons, Paul 6.88. Cf. μοχλίσκος, *naboleus*. See Milne, Pl. XLI, 1.

ἀναρραφικὸν σμῖλλον

Knife for operation on the eyelid. Aetius 7.71; Paul 6.8 *et passim*. See M–S, Taf. V, 5.

ἀντιβολάδιον / antiboladium

Bone lever? (see App. I above, *s.v.*). S (9th and 11th).

ἀντίθετοι

See ἔκκοπεύς.

ἀντιστόμον / antiothomum

Tonsil knife (App. I above, *s.v.*). S (9th and 11th). Cf. ἄγκυλοτόμον.

ἀντόπτρα

Probably a speculum (see App. I above, *s.v.*). S (11th).

ἄπλη

See σμῶλη.

ἀ(πο)ξυστήρ

A raspatory (see App. I above, *s.v.*). S (11th).

ἀρίς / aridion

Bow-drill. Orib. 46.11.7; S (9th and 11th). See R. Caton, *JHS*, 34 (1914), Pl. IX, 23.

αὐλίσκος

Lead tube to prevent contractions and adhesions, Paul, 6.81. Bronze or horn tube to convey medicaments, Orib. 44.12.2 (αὐλ. εὐθύτρογον); the tube of a clyster, Orib. 8.24.62, 8.37.3; tube of a clyster fitting into a catheter, Aetius 6.34; curved bronze tube serving as a guard for a cautery, Orib. 44.20.39. Cf. μοτός, σωλήν, σωληνάριον.

βάραθρον (ἢ ὄργανον) Ἰπποκράτους

Machine for reducing dislocations. Orib. 49.3.27, 49.27; Paul 6.117.

βελόνη

Surgical needle. Orib. 45.18.15 *et passim*; Paul 6.12 *et passim*; Leon III, xx.

βελουλκός

Forceps for extracting weapons. Paul 6.88. See Milne, Pl. XLIV.

βλεφαροκάτοχον / blefarocatochon (*sc.* μύδιον)

Eyelid forceps. Paul 6.8; S (9th and 11th).

βλεφαρόξυστον

Raspatory for treatment of ophthalmia. Paul 3.23.

βλεφαροτόμον

Probably = ἀναρραφικὸν σμῖλλον (see App. I above, *s.v.*). S (11th).

βούγλωσσον

A cautery? (see App. I above, *s.v.*). S (11th).

βρόχος

Ligature. Paul 6.79 *et passim*, Michael Italicus, *loc. cit.* (note 38 above); cord for reductions, Paul 6.118.

γαμμοειδὲς καυτήριον

Gamma-shaped cautery. Paul 6.62, 6.66 (γαμμοειδὲς καυτήρ).

γλωσσοκάτοχον / glossocathocon

Tongue depressor. Orib. 44.11.13; Aetius 8.48; S (9th and 11th). Milne, Pl. XX, 6.

γλωσσοκόμον Νυμφοδώρου

Instrument of reduction. Orib. 49.4.23, 49.21, 46.1.76 (γλωσσοκόμον).

γλωσσοκόμος

A splint. Orib. 46.1.73.

γομφωτήρ

A chisel. Orib. 44.20.15 (ἐκκοπεύς τῶν στενῶν καὶ πάχος ἱκανὸν ἐχόντων).

γραμμιστήρ / grammister

Perhaps a stylus (see App. I above, *s.v.*). S (9th and 11th).

γραφεῖον

Stylus. Aetius 8.36.

deltarium (δελτάριον)

See App. I above, *s.v.*; S (9th).

δέλτος

Medicine box. St. Basil, PG, 31, col. 1444.

δεσμός

Bandage? Michael Italicus, *loc. cit.* (note 38 above).

διαστολεύς

Probably a rectal speculum (see App. I above, *s.v.*). Paul 6.78; S (11th). Cf. ἑδροδιαστολεύς. See Milne, Pl. XLVI, 1.

διέδριον

A type of chair? *Varia Graeca Sacra*, 36, 25.

διόπτριον

See μικρὸν διόπτριον.

διόπτρα / διόπτρον

Vaginal speculum. Paul 6.73; S (11th); Psellus, Ποίημα Ἰατρικόν 1189 (διόπτρον).

διπύρηνον / diripinium.

Probe with olivary enlargements. Orib. 45.18.25; Paul 6.13 *et passim*, 6.77 (διπ. εὐκαμπές of tin or bronze); S (9th and 11th). "Eyed" types; Paul 6.25 (τρῆμα διπ.).

δίφρος

See μαιωτικὸς δίφρος.

διωστήρ / dioster

Impellent. Paul 6.88; S (9th and 11th).

δοῖδυξ

Pestle. Paul 3.59 *et passim*; used like a hammer, Orib. 44.10.4.

δρεπανοειδὲς . . . ὄργανον

Fistula knife. Leon V, xix. Cf. συριγγοτόμον.

ἐγχειρίδιον

Instrument case. Isidore, *Etym.* IV, XI, I; S (9th) has *in-cliridium*, see App. I above, *s.v.*

ἑδροδιαστολεύς

Rectal speculum. Orib. 44.20.66; Paul 6.78. Cf. διαστολεύς, μικρὸν διόπτριον.

ἐθειρολόγος

Epilation forceps (see App. I above, *s.v.*). S (11th). Cf. τριχολαβίς, -ον.

ἐκκοπεύς / etcopetis.

Chisel. Orib. 44.20.12; Paul 6.43 *et passim*; S (9th and 11th). In some cases chisels were used in pairs, the one to steady the other (ἀντίθετοι); see Paul 6.77, 6.90, 6.108 and Milne's discussion pp. 122–23. Cf. γομφωτήρ, φακωτὸς ἐκκ., σμλωτὸς ἐκκ. See L. J. Bliquez (note 2 above), 12.

ἐλασμα

The flat part of an instrument; e.g., μήλης. Orib. 44.8.3; μνηιγοφύλακος, Orib. 44.8.2; καυτηρίου Orib. 44.20.3; κατιάδος, Orib. 44.11.4.

ἐλασμάτιον

Probe (of tin). Orib. 50.10.7.

ἐμβρυοθλάσσης

Cranioclast. S (11th). Cf. *cefaloclases*. See M–S, Taf. VI, 1.

ἐμβρυοσφάκτης

Spike for dispatching a fetus. S (11th).

ἐμβρυοτόμον / enbriotomum

Perforator for the fetal cranium. S (9th and 11th). See M–S, Taf. IV. 6.

ἐμβρυουλκός

Embryo hook. Paul 6.74; S (11th); Psellus, Ποίημα Ἰατρικόν 1187. See Milne, Pl. L, 1.

ἐνετήρ

Clyster. S (11th). Cf. κλυστήρ.

ἐντε(ρο)φύλαξ

Guard (see App. I above, *s.v.*). S (11th). Cf. μνηιγοφύλαξ.

εὐμενιστήρ

Blunt dissector. Paul 6.5, 6.36. Cf. λαβίδιον. See Milne 24, 84–85.

epibastes (ἐπιβιαστήρ)

See App. I above, *s.v.*

ἐπίδεσμος

Bandage. Orib. 46.1, *passim*; Paul 6.99; Leon VI, x, etc.

ἐπίκοπον / epicopo / ἐπικόπιον

Block. Orib. 44.20.77; Paul 6.67; S (9th and 11th).

ἐπικρουστικὸν φλεβοτόμον

A type of phlebotome. Aetius 6.8. See Milne, Pl. VIII, 3.

ἐπικρούστιον

Very likely = ἐπικρουστικὸν φλεβ.; see App. I above, *s.v.*

Ἐρμῆς

See κίων Ἐρμῆς.

Etfolocus

S (9th), "fraglich."

ἡλωτὸς καυτήρ

Nail-shaped cautery. Paul 6.66.

ἡμισπάθιον

A type of knife. Orib. 44.20.57 (ἡμισπαθιον), 44.20.66; Paul 6.71, 6.78. Cf. σπαθίον. See M–S, Taf. IV, 7, 8.

θυία

Mortar. Aetius 7.101 *et passim*. Cf. ἰγδίον.

ἰγδίον

Mortar. Paul 3.59 (lead) *et passim*.

ἱμάς

Thong for extension. Paul 6.118.

ἱπωτήριον

Papyrus tent to hold σωληνάριον, Orib. 50.9.8; bougie, Orib. 44.20.61, 44.21.9; a plaster, Orib. *Ecl. med.* 51.10.

ἱπωτρίς σπάθη

Instrument of reduction. Orib. 49.18.9, 49.33.4–5.

ἴρις

Ear clyster. Paul 6.73. Cf. ὠτικὸς κλυστήρ, *otemquites*.

ἴσσαι

Ignited medullary wood of walnut tree. Paul 6.49.

καθετήρ

Catheter. Paul 6.59; Leon VI, iv; *Typikon*, 1270; Psellus, Ποίημα Ἰατρικόν, 1369. Cf. σωληνάριον. See Milne, Pl. XLV, 1, 2.

καλαμὶς πετροῦ ὀρνιθείου

Shaft of a bird's feather used in place of a σωληνάριον. Orib. 50.9.8.

καλαμίσκος / calamiscos

Drainage tube, Paul 6.50, S (9th and 11th), cf. σίφων, μωτός; a tube used in weapons extraction, Paul 6.88. See Milne, Pl. XXXIX, 2, 3.

κάλαμος

Insufflator. Orib. 44.21.9, 8.13.1 (of bronze or a natural reed). See also χύτρα. See Milne, Pl. XL, 4.

κατιάς / κασία / cacias

A type of phlebotome. Orib. 44.11.3; Aetius 8.48; Paul 6.74; S (9th and 11th).

καυλοκλυστήρ

A type of clyster (see App. I above, *s.v.*). S (11th).

καυτήρ / καυτήριον

Cautery. Orib. 50.7.4; Aetius 6.24 (πλατύτερον καυτ.); Paul 6.45 *et passim*, 6.77 (κ. σιδηροῦν), 6.42 (λεπτὸν καὶ ἐπιμηκὲς κ.), 6.54 (λεπτὸν καυτ.), 6.50 (λεπτὸν σιδηροῦν κ.), 6.48 (μακρὸν καυτ.); St. John Climacus, PG, 88, cols. 1168–1169 (καυστήρ); Leon II, ii *et passim*; *Τυρῖκον*, 1274 (σίδηρα καυτηριῶν, as though there were a καυτηρία). Cf. the following, special types: αἰγίλωπικόν, γαμμοειδές, ἡλωτός, μαχαιρωτός, μηννοειδές, πλινθωτός, πυρηνοειδές, συριγγιακός, τριαινοειδές, φακωτός, ψυχροκαυτήρ, and a cautery fitting in a tube, *s.v.* αὐλίσκος. See Milne, Pl. XL, 1.

κέρας

Tube of clyster. Orib. 8.32.7. Cf. κλυστήρ.

κέστωρ / κέστρος / cestros

See App. I above, *s.v.*; S (9th and 11th).

κεφαλικὸν σφυρίον

Surgical hammer. Orib. 46.11.19. Cf. σφυρά.

cefaloclastes (κεφαλοκλάστης)

Cranioclast (see App. I above, *s.v.*). S (9th). Cf. ἐμβρουσθλάστης.

κιρσουλκός

Retractor for varicose veins. Orib. 45.18.5 (ἄγκιστρα τῶν σφόδρα μικροκαμπῶν, καλουμένων δὲ κιρσουλκῶν, γαμμοειδῆ κατὰ τὴν καμπήν).

κίων ὁ λεγόμενος Ἐρμῆς, κίων τοῦ Ἐφεσίου Ἡρακλείδου

Instrument of reduction. Orib. 49.4.39, 49.4.48.

κλίμαξ

Instrument of reduction. Paul 6.114.

κλυστήρ

Clyster; see Oribasius, book 8, for all sorts of data. Orib. 8.24.62: straight (εὐθύτητος) and side (παράτητος) bore; Paul 6.52; Leon V, ix; S (11th). Theophanes Nonnos (Bernard) I, 290. Cf. ὠτικὸς κλυστήρ, αὐλίσκος, κέρας, *olemqûites*. Milne, Pl. XXXVIII, 1–2.

κοπάριον

Probe. Paul 6.62 *et passim*, 6.85 (λεπτόν), 6.78 (τετρημένον). Cf. ὑδροκλικὸν κοπάριον.

κουφιστήρ

Ring pad around trephine opening. Orib. 46.19.11.

κόραξ

Curved knife. Orib. 44.7.5. Cf. ὀξυκόρακον.

κυαθίσκος / quiatiscos

Scoop, Paul 6.40 (κυαθίσκος μήλης); S (9th and 11th). Cf. τραυματικὴ μῆλωτις. See L. J. Bliquez, "Roman Surgical Instruments in the Johns Hopkins University Institute of the History of Medicine," 56 (1982), nos. 19–24 (pp. 205–9).

κύαθος

Spoon. Orib. 45.29.26 *et passim*, *Ecl. med.* 38.4 (κ. . . . πλήθος τριωβόλου); Aetius 6.63 *et passim*. See L. J. Bliquez, "Roman Surgical Instruments" (*op. cit.*), *s.v.* κυαθίσκος, no. 5 (p. 200).

κυκλίσκος, (sc. ἐκκοπεύς)

Hollow chisel/gouge. Orib. 46.21.17; Paul 6.90.

κυνορράφιον

See App. I above, *s.v.*; S (11th).

κυρτὶς

Strainer. Paul 7.20. See Milne, 165.

λαβή / λαβίδιον τοῦ σμιλίου

Blunt dissector. Orib. 45.6.6, 45.17.6; Aetius 6.1.

λαβὶς / λαβίδιον

Forceps (see App. I above, *s.v.*). Aetius 6.91, 7.21 (λαβίδιον); S (11th).

λεπτάριον

See App. I above, *s.v.*; S (11th).

λεπτομήλη

Sound (see App. I above, *s.v.*). S (11th).

λημνίσκος

Pledget; Orib. 44.11.5, 50.49.1 (λ. στενόν); Aetius 6.1; Paul 6.73. Bandage; Orib., *Ecl. med.* 97.41.

λιθοτόμον / lithothumum

Knife/hook combination for lithotomy. Paul 6.60; S (9th and 11th). Cf. λιθουλκός.

λιθουλκός

Stone extractor. Orib. 45.6.6; Paul, 6.60. See Künzl, Hassel, Künzl, *Bjb*, 182 (1982), 47, nos. 17, 18.

λικώνυμος

Ligature (?). Michael Italicus, *loc. cit.* (note 38 above).

μαιωτικὸς δόφρος

Chair for birthing and fumigation. Orib. 10.19.

malium

Small probe? (see App. I above, *s.v.*).

μασχαλολαβεύς / mascalolabeos

Instrument of reduction? (see App. I above, *s.v.*). S (9th and 11th).

μάχαιρα / μαχαίριον / macherium

Scalpel. St. John Climacus, PG, 88, cols. 1168–1169 (μάχαιρα); S (9th and 11th). Cf. σμίλη, etc. See Milne, Pls. V–VI.

μήλη / mele

Probe. Orib. 44.8.2 *et passim* (πλάτυ μήλης), 44.13.20 (πύρην μήλης); Aetius 6.91 (μήλης ἔριον ἐχούσης); Paul 6.9 *et passim*; S (9th and 11th). Cf. λεπτομήλη, μῆλωτις, σπαθομήλη, πυρηνομήλη. See Milne, Pls. X–XIII; M–S Taf. I, 2–8.

μηλωτρίς / μηλωτρίς

Ear probe. Orib. 44.7.16 *et passim*, 44.21.12 (μ. ἐπ' ἄκρου τροῖμα ἔχουσα), 44.19.5 (of tin or lead to explore fistula), 44.20.53 (τῆς μ. πυρῆν; see Milne's discussion, p. 7.); Aetius 8.25 (μηλωτρίδι ἔριον παρειλήσας); Paul 6.13 *et passim*; S (11th); Michael Italicus, *loc. cit.* (note 38 above). Cf. τραυματικὴ μηλωτρίς. See Bliquez, "Roman Surgical Instruments" (*op. cit.*), *s.v.* κυαθίσκος.

μηνιγγοφύλαξ / meningofilax

Guard. Orib. 44.8.2. *et passim*; Paul 6.77 *et passim*; S (9th and 11th). Cf. ἐντεροφύλαξ. See Milne, Pl. XL, 3.

μηνοειδὲς καυτήριον / μηνοειδὴς καυτήρ

Lunated cautery. Orib. 50.7.4; Paul 6.57. Cf. καυτήριον. See L. J. Bliquez, "An Unidentified Roman Surgical Instrument in Bingen," *JHM*, 36 (1981), 219–20, and Fig. 1.

μητρανύκτης

See App. I above, *s.v.*; S (11th).

μητρογχύτης / metrochites

Uterine irrigator. S (9th and 11th).

μικρὸν διόπτριον

Rectal speculum. Orib. 44.20.66. Cf. διαστολεύς.

μοτοφύλαξ

Bandage to keep a μωτός in place. Orib. 44.7.8 (πτυγμάτιον δίσπυχον ἢ τρίπυχον), 44.20.74 (μοτοφυλάκιον).

μωτός / μωτάριον

Shredded lint tampons. Orib. 44.7.8, 44.20.74; Paul 6.28.

μωτός

Tube to prevent contractions and adhesions, Paul 6.25; a tent, Paul 6.25 (ἐλλυχνιωτὸν μωτόν); a drainage tube, Aetius 6.1. Cf. σωλήν, καλαμίσκος. See Milne, Pl. XXXIX, 1.

μοχλίσκος

Bone lever. Paul 6.106 (iron preferred). Cf. ἀναβολεύς.

μύδιον

Tissue forceps. Orib. 50.9.7 *et passim*; Aetius 8.64; Paul 6.70 *et passim*. Cf. σαρκολάβον. See Milne, Pls. XXVIII, XXIX.

naboleus

Cf. ἀναβολεύς.

νάρθηξ / νάρθηκιον

Splint. Orib. 44.20.74; Paul 6.99 *et passim*, 6.92 (splint for the jaw).

nastcium

Probably = νάρθηκιον; S (9th).

ξύστηρ / xister / ξυστήριον

Raspatory. Orib. 46.9.4; Paul 6.90, 6.12 (ξύστηριον). Cf. ἀποξύστηρ, περιξύστηρ.

ξύστρα

Strigil or scraper for removing hair. Aetius 6.63.

ὀδοντάγρα / odontagra

Tooth forceps. Paul 6.28 *et passim*; S (9th and 11th). Cf. ὀστάγρα, ῥιζάγρα, σταφυλάγρα. See H. Cüppers, *Kranken- und Gesundheitspflege in Trier und dem Trierer Land von der Antike bis zur Neuzeit* (Trier, 1981), 40 (Abb. 22).

ὀδοντοξύστης / ὀδοντοξύστηρ / odontoxister

Tooth scaler (see App. I above, *s.v.*). S (9th and 11th).

olyroxyster

See πολυποξύστης.

ὀξεῖα (*s.c.* σμίλη)

See App. I above, *s.v.*; S (11th).

ὀξύκόρακον (*sc.* σμιλίον)

Curved knife. Paul 6.87, Cf. κόραξ.

ὀξύλαβίδιον

Small forceps; see App. I above, *s.v.*

ὄργανον

Instrument of reduction, of which the following types are attested: τὸ τοῦ τέκτονος (Orib. 49.4.8; 49.24); τὸ τοῦ Ἀνδρέου (Orib. 49.4.8); τὸ Φιλιστίνωνος (Orib. 49.4.38).

ὄργανον . . . τρία σμίλια ἴσα

Scarifier. Paul 6.41.

ὀστάγρα / osteagra

Bone forceps. Orib. 44.8.7; Paul 6.74; S (9th and 11th); *Tyrikon*, 1270. Cf. ὀδοντάγρα, ῥιζάγρα, σταφυλάγρα, ὀστανалаβεύς. See Milne, Pl. XLIII.

ostanaboleos

Bone lever; see App. I above, *s.v.*; S (9th).

ὀστανалаβεύς

See App. I above, *s.v.*; S (11th).

ὀστεγχύτης

Bone irrigator; see App. I above, *s.v.*; S (11th).

ὀφθαλμοστάτης / ostalmostater

See App. I above, *s.v.*; S (9th and 11th).

παρακεντήριος / paracenteter

Couching needle. Paul 6.21; S (9th and 11th). See Milne, 69–71 and Pl. XVI, 2–7.

παρastoλεύς / parastoleus

See App. I above, *s.v.*; S (9th and 11th).

περιλαβεύς / peribabeos

See App. I above, *s.v.*; S (9th and 11th).

περιξύστης / perixister

Raspatory. Orib. 46.11.29 (περιξύστηρ); Paul 6.25; S (9th and 11th).

πιλάριον

Cap or bandage for hydrocephalus. Aetius 6.1.

πλάτυ

The spatula on a probe. See μήλη.

πλευροπριστήρ / pliorprister

Rib-saw (see App. I above, *s.v.*). S (9th and 11th).

πλινθίον τοῦ Νειλέως

Instrument of reduction. Orib. 49.4.23, 49.8.

πλινθωτὸς καυτήρ

Brick-shaped cautery. Paul 6.66.

πολυπικὸν σπαθίον

Polyp knife. Orib. 45.6.3; Paul 6.23 *et passim*, 6.25 (πολ. σπαθ. τῷ μυρσηνοειδεῖ ἀκμαίῳ). Cf. ῥινοσπάθιον. See Milne, Pl. VIII, 1; M–S, Taf. IV, 13.

πολυποξύστης

Forceps/rugine combination for polyp. Paul 6.25; S (9th), *olyboxister*. See Milne, Pl. VIII, 1.

πολυ(πο)σφάκτης

Probably a forceps/rugine combination; see App. I above, *s.v.*

πολυποτόμον

Πολυπικὸν σπαθίον. Leon III, ii.

πρασιά / prasia

See App. I above, *s.v.*; S (9th and 11th).

πριαπίσκος

A tent. Orib. 44.20.72, *Ecl. med.* 15.1; Paul 6.72.

πρίων / pironin

Saw. Orib. 44.20.18; Paul 6.77 *et passim*; S (9th and 11th). See Milne, Pl. XLI, 3: M–S, Taf. III, 1.

πτέρον

See καλαμίζ, σύριγξ.

πτερυγοτόμον / pteriotimum

Pterygium knife. Aetius 7.62; Paul 6.15 *et passim*. See M–S, Taf. VIII, 11.

πύαλος

Bathing tub (App. I, above, *s.v.*). Paul 6.65; S (11th).

πυσυλκός

Pus extractor. Orib. 44.12.2. (with a wide bore); S (11th).

πυρήν

Olivary enlargement on the end of a probe (see *s.v.* μήλη, μηλωτής) or a needle (see Paul 6.21).

πυρηνοειδὲς καυτήριον

Olivary cautery. Orib. 45.19.1; Paul 6.2 *et passim*, 6.47 (λεπτόν); Aetius 6.50.

πυρηνομήλη

Probe with olivary enlargement. Paul 6.42. See Milne, Pl. XI, 1,3,5.

ῥαφίς

Needle (see App. I above, *s.v.*). S (11th).

ῥίζαι

Ignited roots. Orib. 10.11.

ῥιζάγρα / rizoagra

Stump forceps. Paul 6.88; S (9th).

ῥινάριον

File. Paul 6.28; Aetius 8.32 (iron, with an olivary enlargement); S (9th and 11th) ῥινοτορίνιον / rinotorine. See Milne, Pl. XVI, 1.

ῥινεγχύτης

Nasal syringe. Aetius 6.96.

ῥινοσπάθιον / rhinuspatium

Polyp knife. S (9th and 11th). Cf. πολυπικὸν σπαθίον.

σαλπύγιον (?)

See App. I above, *s.v.* σαλπινξ. S (11th).

σανίδιον

Splint. Orib. 44.20.74 (of limewood).

σαρκολάβον / sarcolabon

Tumor forceps. Orib. 45.10.2; Paul 6.17 *et passim*. Cf. μύδιον. See M–S Taf. X, 3.

σιδήριον

Lancet; see M. Delehay, *Les Saints stylites* (Brussels, 1923), 219.

σίδηρον

See καυτήρ.

σίδηρος

Scalpel; see Theophanes Nonnus (Bernard), II 66.

σικύα

Bleeding cup. Orib. 7.15–18 (glass, horn, bronze, various shapes); Aetius 6.28 (κουφή); Paul 6.41; Schol. Nicandri *Theriaca* 921 (iron); Leon VII, xvii, xx.

σίφων

Drainage tube. (See App. I above, *s.v.*). S (11th).

σκηνορράφιον

Needle. (See App. I above, *s.v.*). S (11th).

σκολόπιον

A knife. Orib. 50.5.4, 50.9.3 (σκόλοψ στενός); Paul 6.50.

σκολοπομαχαίριον

Another name for σκολόπιον. Paul 6.6 *et passim*. See M–S, Taf. III, 3.

σκυθομήλη

See App. I above, *s.v.*; S (11th).

σκυλισκωτός (*sc.* ἔκκοπεύς)

Gouge. Paul 6.90. Cf. κυκλίσκος.

σμίλη, etc.

Scalpel. Orib. 45.21.2; Paul 6.39, 6.86 (ὀξεῖα σμίλη), 6.77 (σ. κατὰ τὸ οἰκεῖον σχῆμα); Orib. 44.20.4 (σμιλίον), Aetius 7.82 (σμιλίον στενόν), Paul 6.12 *et passim*; Aetius 6.1, 8.48 (σμιλάριον); S (9th, *hismilarium*, and 11th, σμήλα). Cf. ἀναρραφικὸν σμιλίον, κόραξ, μαχαίριον, λαβή. See Milne, Pl. V.

σμιλωτόν (*sc.* ὄργανον)

Tooth scaler. Paul 6, 28. Cf. ξυστήριον.

σμιλωτός ἔκκοπεύς

Chisels for bone work. Orib. 44.20.74; 46.11.17.

σπάθη

Block. Orib. 44.20.18. See also ἱπωτρίς.

σπαθίον

Knife. Paul 6.6 *et passim*. Cf. πολυπικὸν σπ.; σπ. συριγγοτόμον.

σπαθιοτόση

See Milne, 141; = ὑποσπαθιστήρ.

σπαθομήλη / spatomele

Spatula probe. Orib. 44.11.13; S (9th and 11th); Michael Italicus, *loc. cit.* (note 38 above). See μήλη, πλάτυ μήλης. See Milne, Pls. XII, XIII.

σπαρτίον

Cord. Leon II, xxii.

σπλήν

Compress. Paul 6.115.

σπόγγος

Sponge. Orib., *passim* books 44 and 45; Paul 6.41 *et passim*; St. John Climacus, PG, 88, 1168–1169; Leon V, ix.

σταφυλάγρα

Uvula forceps. Paul 6.31 *et passim*. Milne, Pls. XXX, XXXI.

σταφυλεπάρτης

Perhaps σταφυλάγρα, but see Milne, 89. Paul 3.26.

σταφυλοκάτοχος

σταφυλάγρα. Aetius, *apud* J. G. Schneider, *Nicandri Alexipharmaka seu De venenis in potu cibove homini datis eorumque remediis carmen* (Halle, 1792), ad 511 (p. 243).

σταφυλοκαύστης / stafilocautes

Forceps for application of caustic. Paul 6.31, 6.79; S (9th and 11th).

σταφυλολαβίς

σταφυλάγρα (see App. I above, *s.v.*). S (9th).

σταφυλοτόμον / stafilotomon

Uvula knife. Paul 6.31; S (9th and 11th).

στοματοδιαστολεῦς

Device to keep the mouth open. Orib. 44.11.13.

στοματῖ

S (11th) "fraglich."

συριγγιακὸς καυτήρ

Cautery for fistula. Leon II, xxii.

συρίγγιον

Tube for scarification. Paul 6.87 (bronze or iron).

σύριγξ πτέρου σκληροῦ

Same as συρίγγιον. Paul 6.87.

συριγγιότομον / syringotomum

Fistula knife. Orib. 44.20.57; Paul 6.52 (ὄρθον), 6.78 (σπαθίον συριγγιότομον, δρέπανος τοῦ συριγγ.); S (9th and 11th).

σφηνάριον

Wedge to keep the mouth open. Orib. 44.11.13 (of oak).

σφηνίσκος

Pledget. Aetius 7.82, Paul 6.7, 6.81; = σφηνάριον, Orib. 8.6.21.

σφυρά

Hammer. Orib. 46.21.20; Paul 6.90. Cf. κεφαλικὸν σφυρίον. See S. Zervos, *Les Bistouris, les sondes et les cures chirurgicales d'Hippocrate* (Athens, 1932), 53, Fig. 42.

σωληνάριον

Tube for preventing adhesions and contractions. Orib. 50.9.8 (bronze or tin); Paul 6.91 (lead); catheter, Paul 6.57 (lead); part of fumigation apparatus, see χύτρα. Cf. σωλήν.

σωλήν

Tube for preventing adhesions and contractions. Orib. 44.20.72 (lead or tin), Paul 6.55 (lead); drainage tube, Orib. 44.5.12 (tin); a box or pipe for keeping a broken limb straight, Paul 6.106 (wood or clay). Cf. μοτός, αὐλίσκος.

ταινία

Strap for retracting flesh. Orib. 44.20.18.

τελαμών

Bandage, Orib. 10.18.15; tourniquet, Orib. 7.9.1 (εὐτονος); = ταινία, Orib. 44.20.18.

τετραπάλος / tetrafixos

See App. I above, *s.v.*; S (9th and 11th).

τετρημένον

See κοπάριον.

τραυματική μηλωτής

Scoop for removal of impacted weapons, Orib. 46.11.26; Paul 6.88 (κναθίσκος τ. μ.).

τριάνα ἢ τριαινοειδὲς καυτήριον

Trident-shaped cautery. Paul 6.48.

τρῆμα

Eye of a probe. See μηλωτής.

τρίσπαστον Ἀπελλίδος ἢ Ἀρχιδήμου

Triple pulley for reductions. Orib. 49.4.23, 49.23.

τριχολαβίς / τριχολάβον / triclolabon

Tweezers. Paul 6.13 *et passim*; S (9th and 11th). Milne, Pl. XXVI.

τρύπανον / tripanin / τρυπάνη

Drill. Orib. 46.11.7 (ἀκμή τοῦ τρυπ.) *et passim*, 44.20.12 (τρυπάνη); Paul 6.77 *et passim*. See Milne, Pl. XLII, 3–5.

τυφλάγκιστρον

Blunt retractor. Orib. 45.18.9 *et passim*, 45.6.6 (τυφλ. μεγαλοκαμπές); Aetius 8.66; Paul 6.62 *et passim*; *Varia Graeca Sacra*, 36, 25. See Milne, Pl. XXIII, 3, 4.

ὑδροκηλικὸν κοπάριον

A dissector; see Milne, 85; M–S 24–25. Paul 6.62, 6.82 (ἐπικαμπές).

ὑπερβιβαστήρ

See App. I above, *s.v.*; S (11th).

ὑπερον

Instrument of reduction. Paul 6.114, 6.118.

ὑποσπαθιστήρ

Periosteal elevator. Paul 6.6; Psellus, Ποίημα Ἰατρικόν 1334. Cf. σπαθιστήρ. See M–S, Taf. III, 3.

φακωτὸς οἱ φακοειδὲς ἐκκοπεύς

Lenticular. Orib. 46.21.20; Paul 6.90. See Milne, Pl. XL, 2.

φακωτὸς καυτήρ

Lentil-shaped cautery. Paul 6.66.

Φισίτερ (φυσστήρ)

A bellows. S (9th).

φλεβοτόμον / flebotomum

Phlebotome. Orib. 50.5.4; Paul 6.5 *et passim*; St. John Climacus, PG, 88.1168–1169; Leon I, i; *Typikon*, 1270. Cf. ἐπικρουστικόν, κατιάς. See M–S, Taf. IV, 9.

χαράκτης

Trephine? (see Milne, 131–33). S (11th).

χερσιβόξεστον χαλκοῦν

Bronze washbasin. *Typikon*, 1270.

χοινικίς

Trephine. Paul 6.90; S (11th). See J. Como, *Germania*, 9 (1925), 160 (Abb. 6, 1–5).

χύτρα (+ καλαμὸς + σωληνάριον)

A fumigation apparatus. Orib. 10.19.1–4; Aetius 16.80.

ψαλὶς / psallidium

Scissors. Orib. 43.36.42 *et passim*; Paul 6.58 *et passim*; S (9th and 11th). See Milne, Pl. X, 5.

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| 68 | ψυχροκαυτήρ | ώτικος ἴρις |
| 69 | Caustic applicator? Paul 6.58, 6.87; Leon VII, xiv. (ψυχρὸς | Ear syringe. Paul 6.73. |
| 70 | καυτήρ). Cf. σταφυλοκαύστης. | |
| 71 | otemquites (ώτεγχύτης) | ώτικος κλυστήρ |
| 72 | Ear syringe. S (9th). Cf. ώτικὸς κλυστήρ. | Ear syringe. Orib. 8.24.65; Paul 6.59. |